

A SIMPLIFIED REFERENCE MODEL

The figure shows the **protocol stack** implemented in the system according to the reference model. **End-systems**, such as the PDA and computer in the example, need a full protocol stack comprising the application layer, transport layer, network layer, data link layer, and physical layer. Applications on the end-systems communicate with each other using the lower layer services. **Intermediate systems**, such as the interworking unit, do not necessarily need all of the layers. The **inter-working function (IWF)** is a method for interfacing a **wireless telecommunication network** with the public switched telephone **network (PSTN)**. The IWF converts the data transmitted over the air interface into a format suitable for the PSTN.

a) **Physical layer:** This is the lowest layer in a communication system and is responsible for the conversion of a stream of bits into signals that can be transmitted on the sender side. The physical layer of the receiver then transforms the signals back into a bit stream. For wireless communication, the physical layer is responsible for frequency selection, generation of the carrier frequency, signal detection (although heavy interference may disturb the signal), modulation of data onto a carrier frequency and (depending on the transmission scheme) encryption.

b) **Data link layer:** The main tasks of this layer include accessing the medium, multiplexing of different data streams, correction of transmission errors, and synchronization (i.e., detection of a data frame). Altogether, the data link layer is responsible for a reliable point-to-point connection between two devices or a point-to multipoint connection between one sender and several receivers.

c) **Network layer:** This third layer is responsible for routing packets through a network or establishing a connection between two entities over many other intermediate systems. Important functions are addressing, routing, device location, and handover between different networks.

d) **Transport layer:** This layer is used in the reference model to establish an end-to-end connection

e) **Application layer:** Finally, the applications (complemented by additional layers that can support applications) are situated on top of all transmission oriented layers.

Functions are service location, support for multimedia applications, adaptive applications that can handle the large variations in transmission

characteristics, and wireless access to the world-wide web using a portable device.

Why hexagonal cell shape is perfect over square or triangular cell shapes in cellular architecture?

hexagonal cell shape is preferred over the square and the triangle shapes because:

1) the hexagonal cell shape has a larger area than the square and the triangle, thus less cells will be used to cover a certain geographical region.

2) a hexagonal cell shape closely approximates the circular radiation pattern (used by today's Omni-directional antennas) of the base station (i.e. transmitter). circular cell shapes are not used because of the gaps they leave in between them if implemented.